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AN INEXPENSIVE HUMIDIFIER FEATURING HYGIENIC PRINCIPLES

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Closely controlled atmospheric conditions are essential for the successful rearing of insects, either in small experimental lots or in mass production for economic purposes. Equally essential is extreme cleanliness of all internal surfaces of the rearing chamber and of all apparatus therein, particularly when dealing with those insect forms susceptible to attack by injurious entomogenous organisms.

An objection to most of the humidifying equipment available for use in incubation chambers, aside from high initial cost, lies in the difficulty of keeping them sterile, owing to complexity of their parts. To overcome this objection an apparatus was designed at the laboratory for corn-borer research, Toledo, Ohio, embodying inexpensive construction, efficiency, and a minimum of parts within the rearing room. The principle employed is the atomization of water by means of air under pressure.

Equipment capable of generating sufficient pressure for this purpose was made by connecting a second-hand tire-inflating compressor from a Winton automobile to a $\frac{1}{4}$ -horsepower motor by means of pulleys and a V-type belt. Motor speed was reduced by means of a 6-inch pulley on the compressor shaft and a $2\frac{1}{4}$ -inch pulley at the motor. Continuity of air flow is obtained by building into the line an air chamber made from a piece of $1\frac{1}{4}$ -inch water pipe $14\frac{1}{2}$ inches long. This chamber is connected to the air outlet by a length of $\frac{1}{4}$ -inch copper tubing. A drip cock to draw off the water of condensation is provided (fig. 1).

Details of the air outlet and suction feed water jet are shown in figures 2, 3, and 4. The nozzles, threaded for fine adjustment of the head, may be purchased from a dealer in spray-painting equipment. Coarse adjustment, to bring the heads into approximate position, is made possible by the use of set screws in the right-angle-shaped metal supporting block. This block is welded to a wall bracket. A rubber tube connects the nozzle with the water supply, which in this case is a $3\frac{1}{2}$ -gallon, zinc, hand-filled tank located outside the chamber. The maximum water level is 1 inch below the outlet. The suction generated raises the water a vertical distance of 8 inches efficiently.

A smaller tank with a float valve connected directly to the water supply could be substituted, but, owing to the efficiency of the humidifier, hand filling should be no great objection except in the case of very large or poorly insulated rooms. The equipment, as installed at Toledo, is capable of raising the relative humidity of the 800 cubic feet of air in the rearing chamber from 20 percent to 70 percent in 4 minutes.

The criterion as to the size of the droplets usable in any specific chamber is that complete vaporization should take place before the particles of water come in contact with any surface. Both the size of the chamber and the relative humidity desired have a direct bearing on this point. It was found that, for an outlet located 5 feet above the floor in the end of a room 16 by 8 by 6.5 feet in dimensions, sufficient pressure was produced by the described apparatus to entirely eliminate visible deposition of moisture for any desired relative humidity within 5 percent of saturation. Increasing the pressure and/or reducing the size of the water orifice, produces finer atomization, thereby decreasing the range of droplet deposition.

An atmosphere of uniform moisture content is maintained by connecting the motor through a relay with a sensitive hair hygrometer.

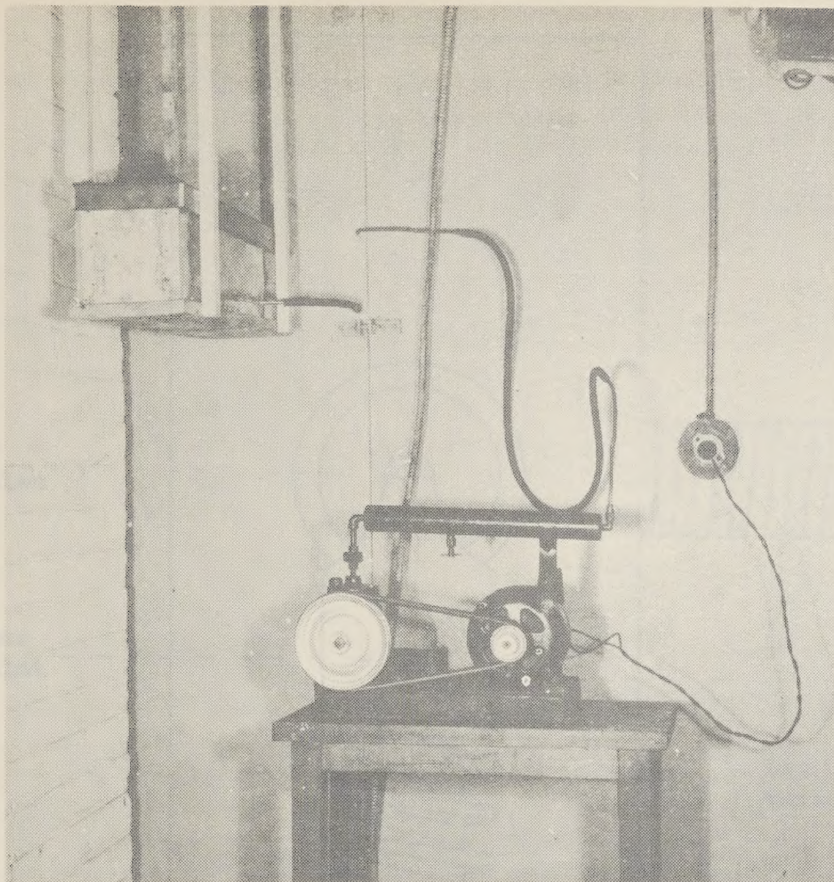


Figure 1.--External installation, showing compressor, motor, air chamber, and water tank.

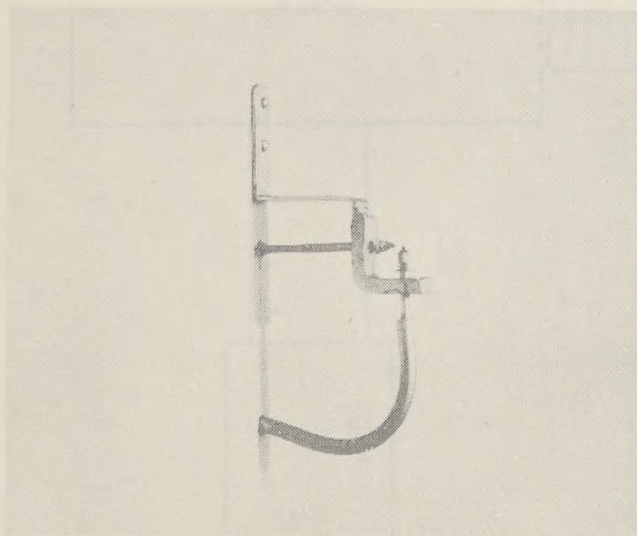


Figure 2.--Internal installation, showing air and water jets.

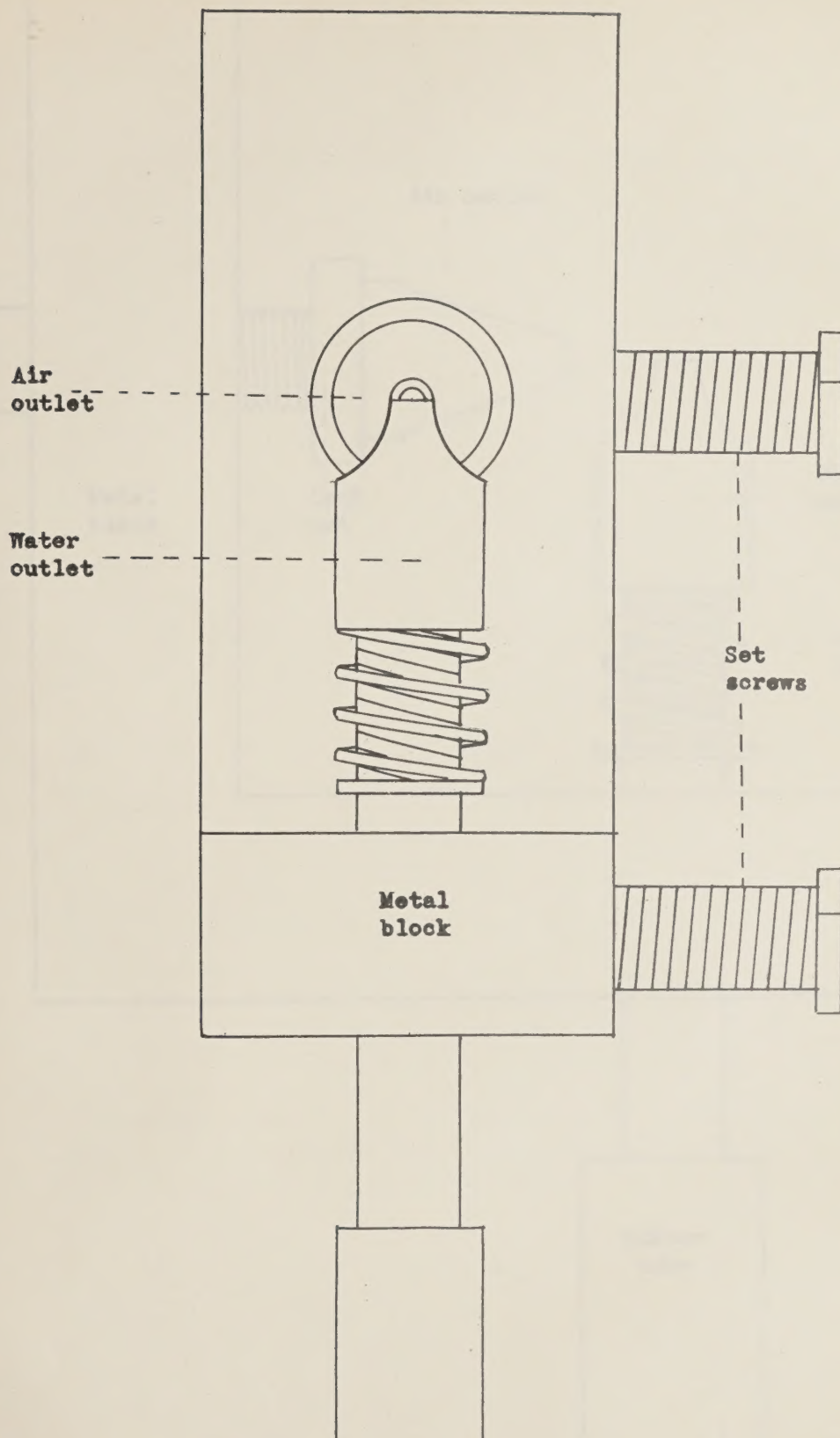


Figure 3.--Detail of humidifier tip adjustment (front elevation).

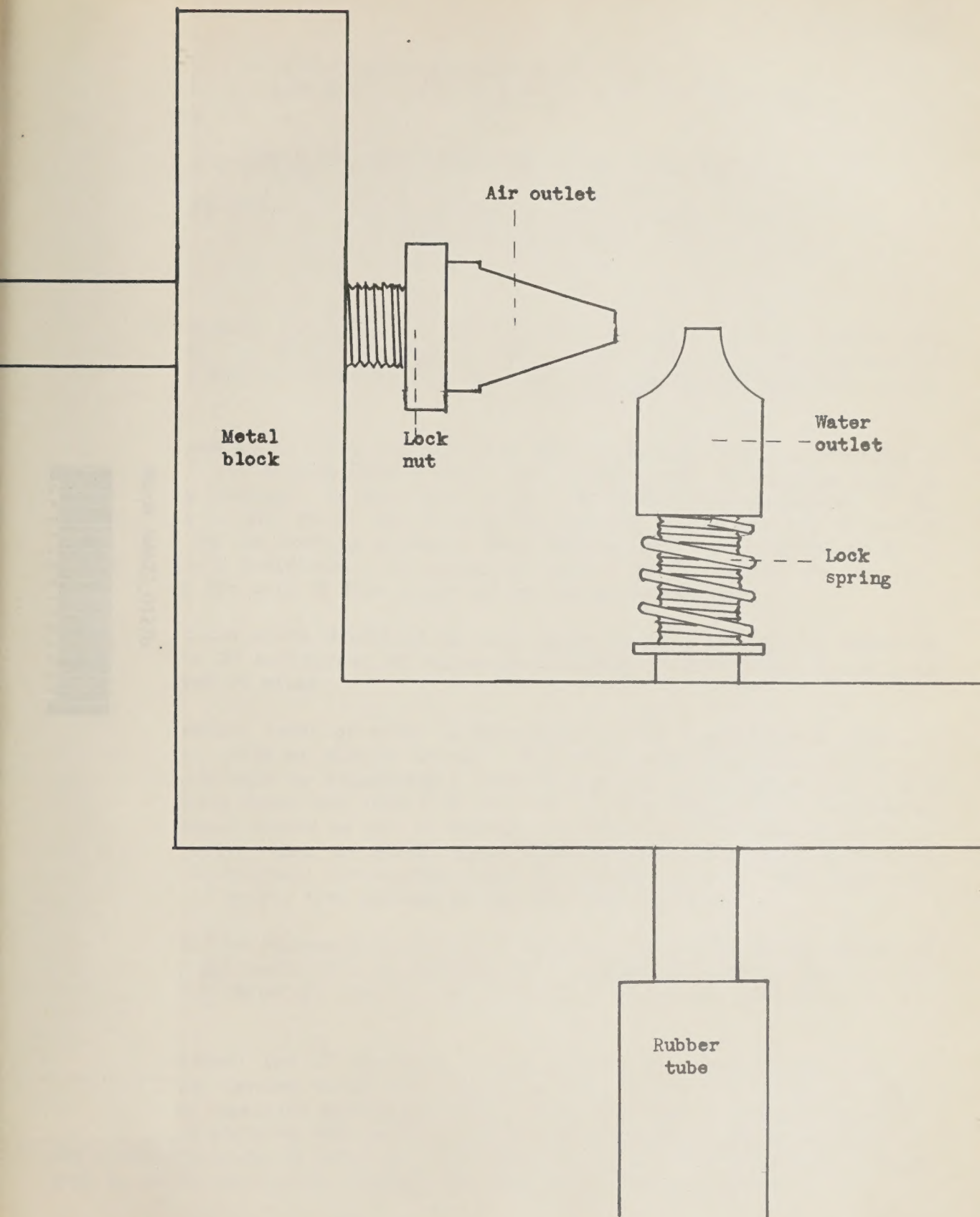


Figure 4.--Detail of humidifier tip adjustment (side elevation).

